



CLINICAL RESEARCH ARTICLE

Physicians' experiences, attitudes and challenges in a Pediatric Telemedicine Service

Motti Haimi^{1,2,3}, Shuli Brammli-Greenberg³, Yehezkel Waisman^{4,5} and Orna Baron-Epel³

BACKGROUND: Telemedicine in general, and telephone triage, in particular, is considered a high-stress clinical activity and involves decision making under conditions of uncertainty and urgency.

AIM: We wanted to explore the experiences, attitudes, and challenges of the physicians in a Pediatric Telemedicine Service operated in Israel, and to explore whether the doctors are using non-medical factors (not related to the medical problem), when making the clinical decisions in this setting.

METHODS: We used a qualitative methodology in order to obtain rich data that would reflect the participants' subjective experiences. Fifteen physicians who worked during the last 5 years in the "Pediatrician Online of Clalit" service were interviewed. Data were analyzed thematically.

FINDINGS: Seven main themes concerning the physicians' challenges during their work at this service were revealed, including difficulties diagnosing from a distance, treating unfamiliar patients, working alone, urgency and load of calls, technological obstacles, and a "moral conflict" between the desire to meet parents' expectations and maintain standards of care. The physicians stated that non-medical factors also affect their decisions.

CONCLUSIONS: In telemedicine setting, physicians face various difficulties and challenges, requiring special expertise, qualities and skills. Special measures are needed to obtain proper diagnosis and decisions.

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INTRODUCTION

"Telemedicine" is the use of communications networks for delivering health care services and medical education from one geographic location to another.^{1,2}

Telephone medicine is common, and is estimated to be used in up to 25% of doctor–patient encounters.³ Telephone consultations allow patients to have contact with healthcare professionals from a distance without the patient having to travel.^{4,5} Telephone consultation mainly serves as a triage, in which medical urgency is determined and appropriate treatment recommendations are made.⁶

In some countries, the initial telephone contact is typically performed by specially trained triage nurses.⁷ Telemedicine may also be used by pediatricians in a broad range of applications.^{8,9}

In 2009, a unique pediatric telemedicine service was established in Israel, named "Pediatricians online service of Clalit", under the auspices of "Clalit" Healthcare Services, Israel's largest HMO. The service is operated by pediatricians (some with additional subspecialty), and professionally supervised by pediatric emergency specialist from Schneider Children's Medical Center. It provides remote consultation for parents who need urgent medical advice concerning their children on evenings, nights and weekends, when the community clinics are closed.^{10,11}

In addition to the initial telephone conversation, pediatricians operating the service can also use live video chat via computer or mobile phone. In addition, they have access to the medical records of the child, including laboratory and imaging data,

previous visits to community clinics, and Emergency Room (ER) visits and hospitalizations.

Unlike nurse tele triage services, this service enables direct communication between the pediatricians and parents, when urgent consultation is needed.

It receives ~300 calls at weeknights and 600 calls per weekend/holiday 24-hour period. The number of physicians is load-adjusted, and varies from 3 doctors/ shift at nights, up to 8 doctors/shift at weekends.

The main goal of this service is to act as a medical triage, deciding which cases are urgent enough to warrant a referral to the ER, and which cases should be taken care of by the community clinics during their operating hours.¹¹ In non-urgent cases, the pediatricians can provide appropriate instructions and even send digital medicine prescriptions.

Telemedicine in general and telephone triage in particular, is a complex task that carries some inherent difficulties and risks compared to in-person consultations. In most cases, visual contact and non-verbal components of communication are absent,^{6,12} and the doctor usually learns about the patient's medical problem from a verbal description alone. Furthermore, in the office setting clinicians usually use cues such as general appearance of patients to decide which patients may be sicker than others,¹³ a benefit that is not available in the telephone triage setting. Other possible difficulties encountered in the telemedicine service may also include diversity of clinical conditions, high incidence of urgent conditions, and limited knowledge of patients' medical history.^{7,14}

¹Clalit' Health Services, Central Division, Tel Aviv, Israel; ²Rappaport Faculty of Medicine, Technion, Haifa, Israel; ³School of Public Health, University of Haifa, Haifa, Israel; ⁴The Emergency Department, Schneider Children's Hospital, Petah-Tikva, Israel and ⁵Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel
Correspondence: Motti Haimi (morx@netvision.net.il, mottiha@clalit.org.il)

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Over the years, some concerns were reported regarding telehealth reliability due to the limited sensory information available to doctors, and threats to patient safety were suspected,^{12,13,15} while other studies reported good results with the tele-health telephone triage.^{6,16}

Usually, physicians are advised to avoid non-medical contextual influences when making clinical decisions, and rely basically on evidential data.¹⁷ In reality, however, patient's management decisions are often influenced by the individual patient's circumstance as well as other non-medical interactional factors.^{18,19}

Study aim

The aim of the study was to explore the experiences, attitudes, and challenges of the physicians in a Pediatric Telemedicine Service ("Pediatricians online service of Clalit"), which operates in Israel.^{10,11} In addition, we wanted to investigate whether the doctors are using non-medical factors, when making the clinical decisions in this setting, and if so, to identify and describe these factors. These insights could be useful in improving this specific service, but can also be implemented in other telemedicine services.

METHODOLOGY

Study design

In this study we used a semi-structured qualitative study (SSQS) methodology²⁰ in order to obtain rich and direct data that would reflect the participants' subjective experiences. Themes were identified from participants' responses and analyzed thematically.

Participants

Physicians were eligible for inclusion if they either currently work at the "Clalit" telemedicine service, or if they worked with the service in the past five year. Fifteen physicians were interviewed, all by the first author. Participants' characteristics are provided in Table 1.

The mean age was 52 years, ranging from 42 to 67 years, nine males and six females, of various religions (Jewish, Muslim and Christian), various districts of residency (north, center and south), various places of birth, and different places of medical school studies. All the participants are pediatric specialists, and seven also have a sub-specialty. The participants also differed in their major place of work (community clinics versus hospital), and in their experience as pediatricians (range 4–30 years), as well as their experience in this pediatric telemedicine service (range 0.5–9 years).

Eleven of the physicians are currently active in Clalit's pediatric telemedicine service, three of them are no longer active in telemedicine, and one participant is active in a different pediatric telemedicine service.

Currently, 50 physicians work in this service. Seven physicians left during the last 5 years. All physicians participated in the study were randomly sampled and were contacted by e-mail and phone, provided with information on the study. After their agreement to participate (confidentially), we completed the interview protocol during a face-to-face meeting, in person, or using Skype. The interviews were recorded and transcribed verbatim. Approval from two Ethics Committees (of "Clalit" and of University of Haifa) has been received.

Data collection

A semi-structured interview protocol was developed to elicit the physicians' experiences, difficulties, and attitudes toward their work at the "Pediatricians online service of Clalit".¹¹ This tool enabled the researchers to focus the participants toward areas of interest while allowing them to expand their answers providing richness of data. Topics for discussion were based

Table 1. Participants' descriptions and demographics

Serial number	Gender	Age (years)	Religion	Place of birth	Residency region	Place of medical school	Major place of work	Years as pediatrician	Sub-specialty	Years in telemedicine	Active in pediatric online service
1	Male	61	Jewish	Israel	North	Israel	Community clinic	27	No	3	No
2	Male	55	Muslim	Israel	North	Israel	Community clinic	22	Yes	7	Yes
3	Male	47	Jewish	Israel	North	Israel	Community clinic	13	No	5	No
4	Female	59	Jewish	Israel	North	Israel	Community clinic	28	Yes	9	Other
5	Male	42	Jewish	USA	Center	Israel	Hospital	5	Yes	0.5	Yes
6	Male	57	Jewish	Israel	Center	Italy	Community clinic	17	Yes	4	No
7	Male	45	Jewish	Ukraine	North	Ukraine	Hospital	4	Yes	5	Yes
8	Female	48	Muslim	Israel	North	Israel	Hospital	15	Yes	3	Yes
9	Female	53	Jewish	Israel	Center	Israel	Community clinic	25	No	3	Yes
10	Male	50	Jewish	Israel	North	Israel	Community clinic	15	Yes	7	Yes
11	Male	67	Jewish	Argentina	Center	Argentina	Community clinic	40	No	3	Yes
12	Female	54	Muslim	Israel	North	Israel	Community clinic	23	No	7	Yes
13	Male	56	Christian	Israel	North	Israel	Hospital	30	No	3	Yes
14	Female	49	Jewish	Soviet Union	South	Moscow	Community clinic	17	No	6	Yes
15	Female	42	Jewish	Israel	Center	Italy	Community clinic	6	No	6	Yes

upon areas of interest to the study and domains identified in the literature.

The protocol consisted of two sections: the first section included questions relating to the overall experience of the shifts, the possible problems and challenges the doctor faced during the shifts, as well as fears and difficulties. The second section consisted of questions regarding decision making under the pediatric telemedicine service model. The questions focused on the different factors affecting the decisions made by the physicians, and especially on the non-medical factors that might have influenced those decisions (Supplemental Figure S1).

The main questions asked in the first part of the interview include:

"Please tell me about your job at "Pediatrician Online", in particular your experience, impressions, difficulties, challenges and insights";

"Are there any special difficulties or concerns during shifts?"

Analysis

We used thematic analysis, a flexible research tool that provides a rich account of qualitative data.²¹ We were interested in the personal experiences, feelings, and insights of the individual participants. Our aim was to reflect and describe the reality of the participants' experiences during their shifts at the pediatric telemedicine service. In order to assess whether the themes accurately reflected the original data, they were evaluated against the original transcriptions to ensure a consistent progression.

The analytical procedure included several stages: in the first phase, after reading the transcribed interview of each participant, the first author identified and labeled themes for each section of text, and compiled these into a list of themes. In the second stage the researchers met as a group, and discussed each participant's interview and the themes previously identified. In the last stage, we integrated the themes into a table and master document that reflected the insights of the group as a whole. We collected

selected quotes available in Supplemental Figure S2 ("SupFig.S2"), enabling readers to assess consistency between the data and our interpretations.

RESULTS

Analysis of the data from the interviews revealed seven main themes relating to the difficulties and challenges of the physicians during their work at the pediatric telemedicine service. These are presented in Table 2, Fig. 1.

Each theme identified is presented with relevant supporting quotes from participants' responses. Each participant was assigned a code (number), in order to retain anonymity. These codes are given after each participant's quote (Supplemental Figure S2, "SupFig.S2").

Theme 1: Diagnose from a distance (remote diagnosis)

The main issue that was repeated constantly by most of the physicians (more than 2/3) working at the "Pediatrician Online" service was concerns relating to making a remote diagnosis, without being able to physically examine the child. We noticed a general level of apprehension in the participants' interviews regarding this issue. Concerns centered primarily on the lack of visual cues (when talking over the phone, or when the video chat is unclear) and inability to conduct a physical exam (SupFig.S2: 1-1).

"There is difficulty making the diagnosis and a treatment decision because you don't physically examine the patient"

One of the major concerns the participants had was their ability to effectively assess risk. The doctors fear that they will fail to assess the severity of the patient's illness, or make a misdiagnosis (SupFig.S2: 1-2 to 1-4). The doctors emphasized that since in this pediatric telemedicine service, the patients are children, in addition to difficulties assessing the patients' situation from a distance, the patients can not accurately express their symptoms, making it more difficult to get to an accurate diagnosis (SupFig.S2: 1-5, 1-6). Some of the doctors stated that the work in telemedicine setting is much more difficult for them than the work as pediatricians in the regular clinics (SupFig.S2: 1-7 to 1-9).

Theme 2: Unfamiliar patients

Some of the physicians (less than 1/3) expressed concern regarding the fact that they do not personally know the patients or their parents. They were specifically worried about difficulties building a therapeutic alliance, devaluing parents' skills, and fear that parents will not necessarily comply with their recommendations (SupFig.S2: 2-1).

"It is difficult to diagnose with certainty...you only rely on what the parent says (whom you don't know)."

They explained that the distance was not only geographical, also in terms of acquaintance with the patients and their parents (SupFig.S2: 2-2). It seemed difficult to rely on the subjective description of the parents (SupFig.S2: 2-3). In addition, it was hard to evaluate how the parents will behave should the situation

Number	Theme	Subthemes
1	Diagnose from a distance (Remote Diagnosis)	
2	Unfamiliar patients	
3	Being alone	
4	Urgency/load	
5	Technology	
6	Moral conflict	1. Good service vs. proper medicine, 2. Inappropriate referrals
7	Overcoming difficulties	1. Helpful tools 2. Non-Medical Factors 3. Practical tips

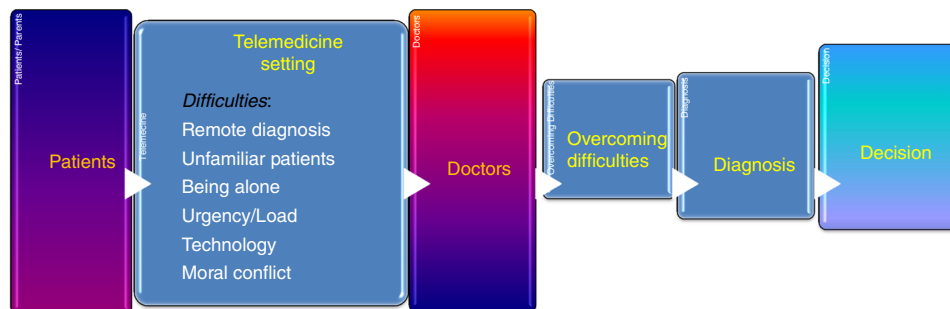


Fig. 1 Main themes and decision process

worsen (SupFig.S2: 2-4). Some doctors said they paid attention to the parents' tone of voice (SupFig.S2: 2-5, 2-6). In order to overcome these problems, the physicians stated that they take into consideration their evaluation of the health literacy of the parents, and their ability to share their decisions with the parents (SupFig.S2: 2-7, 2-8).

Theme 3: Working alone

One of the difficulties mentioned by the physicians was the fact that they work alone, each one from his home, without being able to share their thoughts or hesitations with colleagues (SupFig.S2: 3-1, 3-2).

"There is a feeling that you are alone - there is no one to consult with in a practical manner..."

Despite the fact that consultations with a senior attending physician are possible, it is non-practical for most of the doctors, and many doctors still felt "alone" in the situation (SupFig.S2: 3-3). There are several protocols constructed for special situations, which make it easier to make certain clinical decisions (SupFig.S2: 3-4, 3-5). Some participants wished there were more face-to face meetings to share knowledge, clinical cases and dilemmas, or the ability to consult with peers online during the shifts (SupFig.S2: 3-6).

Theme 4: Urgency/load of calls

In Pediatrics, unlike adult medicine, many cases are acute, appearing quickly and reaching a peak within hours to days. Therefore, online consulting frequently deals with urgent cases—at least from the perspective of the parents. As mentioned, in a large proportion of the cases, the patients are preschool children, and it is difficult for them to accurately describe their symptoms, which makes the diagnosis even more difficult. In addition to the "stress" expressed by some of the parents, many physicians complained about a stressful atmosphere and pressure from the call center operators who transfer the calls to the physicians.

"In ordinary medicine - there is time. Here, there is no time, and we need to make a diagnosis in a few minutes..."

Physicians reported being asked to hurry, since the call center operator was loaded with many calls (SupFig.S2: 4-1 to 4-4).

Theme 5: Technology (technical issues)

Technological challenges were also reported: many doctors (more than half) complained that the systems being used are too complex, and that there is the potential for malfunction which could trigger software or hardware failure. This could hamper the diagnosis process and affect the decisions made, as well as influence the liability of healthcare providers (SupFig.S2: 5-1, 5-2).

"The technology is problematic, very cumbersome: there are multiple programs which can cause delay..."

Many of the participants stated that the video chat option is not useful, due to low camera resolution and quality (SupFig.S2: 5-3, 5-4). Some doctors expressed their wish that the patients (or their parents) be able to send photos (by e-mail) to compensate for this shortcoming (SupFig.S2: 5-5). Due to these technical difficulties, the consultation may take more time than would otherwise be necessary (SupFig.S2: 5-6).

Theme 6: Moral conflict

The doctors expressed a moral conflict in this setting.

Subtheme 1: Good service vs. proper medicine. A conflict was observed between the desire to please parents and provide good service on one hand, and the need to adhere to best medical practices on the other. Patients in Israel need a referral from a physician to ER (either "standard" doctor or in telemedicine). If they self-present to the ER, and won't be hospitalized—they will have to pay by themselves. This fact can explain the cases in which parents demanded a referral to the ER, despite no clinical

indication for an ER visit (SupFig.S2: 6(1)-1 to 6(1)-3).

"It bothered me that the parents would ask for an inappropriate prescription or referral to the ER..."

Subtheme 2: Inappropriate referrals. Doctors were frustrated from the lack of a clear definition for the patients and their parents of the service's goals. The conflict here, again, is balancing the desire to please the parents and answer their questions, with the fact that the service is intended to address urgent medical problems, and not to serve as a substitute for the patient's personal physician (SupFig.S2: 6(2)-1, 6(2)-2). Some doctors described this phenomenon in terms of "Moral Hazard," or inappropriate use of the parents (SupFig.S2: 6(2)-3, 6(2)-4).

"There is a misuse of the service - sometimes the parents ask for a letter of a child's illness for the next day, or for permission to go to kindergarten."

Theme 7: Overcoming difficulties

Some of the participants reported mixed or negative reactions to their experience, expressing concerns about their ability to gather sufficient and appropriate information over the telephone (SupFig. S2: 7-1, 7-2).

Nevertheless, despite these difficulties, many participants reported generally positive experiences of the telephone assessments, and still felt able to undertake a thorough assessment and able to make appropriate treatment decisions. They felt that the tools they gained from their experience as pediatricians and as telehealth consultants were instrumental in helping them overcome the various difficulties associated with pediatric tele triage (SupFig.S2: 7-3 to 7-6).

"Despite the difficulty in making the decision - pictures and video compensate for the lack of physical examination..." "I felt relatively confident and make decisions professionally"

Subtheme 1: Helpful tools

Use of intuition: Many doctors said they use intuition in the diagnostic process. Some of them felt that due to the inability to assess the patient's condition, by conducting a physical exam, their intuition plays a greater role here (SupFig.S2: 7(1)-1, 7(1)-2).

Use of rules of thumb and protocols: Many physicians stated that they used "rules of thumb" in their decision-making process. Most of them also made use of protocols which are available for specific scenarios (SupFig.S2: 7(1)-3 to 7(1)-5).

"I used some rules of thumb. For example-'a jumping boy is not appendicitis'..."

Awareness of cognitive biases: The doctors were also aware of possible cognitive biases, which may systematically affect physicians' judgments or decisions, similar to the more traditional medical setting. The cognitive biases sometimes stems from the doctor's impression of the parent (his profession or language). (SupFig.S2: 7(1)-6 to 7(1)-9).

Doctor's experience improves diagnostic capabilities: Most of the doctors felt that their clinical experience in pediatrics in general, and telemedicine in particular, helps them with diagnostics and decision making. The more experience they had in telemedicine, the more confident they became (SupFig.S2: 7(1)-10, 7(1)-11).

Shared decisions with parents: Some of the doctors reported discussing their thoughts and insights on the diagnostic procedure with the child's parents. They also reviewed possible treatment options with parents and solicit their input. Among the participants of this study, younger physicians tended more to make shared decisions compared to older physicians. It was also apparently noted that doctors who studied medicine in countries

with more conservative or patriarchal cultures tended to make treatment recommendations on their own and not utilize a shared decision-making process (SupFig.S2: 7(1)-12 to 7(1)-18).

Diagnostic uncertainty: In cases where physicians were unsure of the diagnosis or treatment they could invite the parents to a video chat, consult with the senior attending physician, or ask the parents to call again in a few hours. Most of the physicians preferred making a video call or inviting the parents to make another call after several hours. Only a few physicians (generally those who are younger and less experienced), used the option to consult the senior attending physician (SupFig.S2: 7(1)-19, 7(1)-20).

Subtheme 2: Use of non-medical factors. Most of the participants confirmed the use of "non-medical" (non-clinical) factors, in addition to the medical factors, in their decision-making process.

The main non-medical factors that doctors reported to influence decision-making in telemedicine setting:

The doctors' impression of the parents: including their health literacy, level of understanding, tone of voice and level of anxiety. One of the most important components reported to factor into the physician's decision making was the perceived level of health literacy of the parents [SupFig.S2: 7(2)-1 to 7(2)-3]. Key here was the physician's belief that the parent could adequately and appropriately care for their child, and that he will recognize signs of deterioration of the child's condition [SupFig.S2: 7(2)-4, 7(2)-5]. This impression of the parents' literacy and capabilities affected mainly the primary decision: whether or not to refer the patient to the emergency room [SupFig.S2: 7(2)-6 to 7(2)-9], but also in cases where there was no indication for an ER referral [SupFig.S2: 7(2)-10 to 7(2)-12].

Doctors' impression of Socio-demographic status of the family: Including place of residence, distance from medical center and language. Physicians tended to more frequently give an emergency room referral to patients perceived as being of lower socio-economic status. This may be attributed to doctors' impression of connection between socio-economic status and health-literacy, or from their desire to help these families by not having to spend money if they went to the ER [SupFig.S2: 7(2)-13 to 7(2)-16].

Accessibility and opening hours of community clinics: Accessibility of community medical services is also taken into account, by more easily giving referrals to the ER patients living in isolated places. In addition, the physicians tended to send patients more to the ER on the weekends and especially on Fridays (SupFig.S2: 7(2)-17, 7(2)-18). (In Israel, the weekend is Friday-Saturday; community clinics are closed beginning Friday afternoons, and re-open Sunday mornings.)

Fear of lawsuits: Among other non-medical factors, the majority of the doctors reported that legal considerations and a fear of lawsuits (defensive medicine) also influences their decision making in this setting (SupFig.S2: 7(2)-19, 7(2)-20).

Regarding *economic factors*, such as saving money for the health fund (such as by not sending non-severe cases to the ER) most of the doctors confirmed that this is not a consideration for them (SupFig.S2: 7(2)-21, 7(2)-22).

Subtheme 3: Practical tips. Physicians were asked to provide concrete ways in which the telemedicine process could be improved, and their recommendations included (SupFig.S2: 7(3)-1 to 7(3)-7):

Improving the visual capability of the video and enable the physicians to receive photos when needed;

Improving and simplifying the technological equipment;
Developing protocols and tutorials for the doctors;
Enabling online chat of the physician on shift with colleagues when needed, or with a senior physician on call.
Staff additional physicians in each shift, to reduce the call load for each doctor.
Find ways to clarify to patients which issues are suitable for this tele triage service.

DISCUSSION

In this qualitative study, we sought to learn about the difficulties and challenges faced by the physicians in telemedicine setting.

It is not surprising, that the main factor the doctors mentioned was the difficulty to make a diagnosis from a distance, which is attributed to the fundamental difference between the virtual visit and the regular clinic, due to the doctor's inability to perform a physical exam in the telemedicine setting. Unlike the traditional encounter between patient and doctor, in the telemedicine format the doctor learns about the patient's medical problem from his verbal description, usually without being able to see the patient personally or to physically examine him.¹²

Several studies reported that telephone medicine carries threats to patient safety. The main explanation was that telephone medicine removes visual cues, which are used by clinicians in the office setting to determine which patients may be sicker than others.^{12,13} Triage over the phone was even found to miss significant illness.²² On the other hand, recent studies have shown that telemedicine has a positive impact not only on patient clinical outcomes, but also on patient safety.²³ Such benefits of tele health are observed particularly in critical care medicine, and in the reduction of medication errors.²³

Some of the physicians expressed concerns regarding the fact that they do not personally know the patients or their parents. The physicians have limited knowledge of patients' medical history,^{7,14} and they feared that parents will not always be compliant with their instructions. They reported difficulty evaluating how the parents will behave if the situation worsens. This difficulty has also been described in other studies.^{6,7,14} Further concerns centered on the difficulties building a therapeutic alliance, and devaluing the participants' skills. In certain situations, as in pediatric telemedicine service when a child is trying to explain a problem,²⁴ this can be even more difficult.

In order to overcome this problem, the physicians stated that they attempted to determine anxiety levels of the parent, which can be assessed from their tone of voice, a measure that has also been reported.²⁵ The physicians also took the perceived health literacy of the parents into account, which its importance have been described thoroughly in other studies.²⁶⁻²⁸

The physicians also emphasized the fact that they worked alone, each one from his home, without being able to share thoughts or hesitations with their colleagues. Most of them would have preferred the opportunity to discuss difficult cases with a senior physician or with their colleagues. Triage, requires professional judgment, as ruling out urgency is more difficult than identifying it.²⁹ In this situation, decisions are almost always made on the basis of partial or unreliable information.³⁰ As this study has found, it can be difficult make those decisions alone.

The online consulting involves urgent events, at least from the perspective of the parents, and there is general feeling of urgency which is aggravated by the load of calls transferred to the doctors. In decision-making situations such as emergency telephone triage, there is a sense of urgency: decisions often have to be made in seconds; therefore, telephone triage is considered a high-stress clinical activity and may involve a heavy workload and emergency situations, which further exacerbates the difficulty of the decision-making process.³⁰ In fact, high

urgency levels may be associated with suboptimal quality of consultation.³¹

The appropriateness of decisions on estimated urgency was found to decrease with the actual increasing urgency of the case.⁶ On the other hand, when potential high urgency is suspected, clinicians might not want to take risks and make a safe decision, which may result in overestimated urgency.^{6,31} Although telemedicine is heralded as cost-effective approach to preventative medicine and rural and remote medical services,³² it is not without controversy and difficulties.^{33,34}

In addition to complaints about technological problems, the physicians also confessed on the existence of a "moral conflict": a conflict between the desire to please and provide parents with good service on one hand, and the wish to maintain good medical practices on the other.

Nevertheless, despite all the difficulties mentioned above, most participants reported generally positive experiences of the telephone assessments, and still felt able to complete a thorough assessment and to make appropriate treatment decisions, as described in some reports.^{6,24,35,36}

In order to overcome the problems mentioned above, the physicians in this study used different strategies, including use of intuition, use of their experience as pediatricians and telehealth workers, and use of protocols. In cases of diagnostic uncertainty they increased the use of video chats, invited the parent for additional follow-up phone calls, or consulted with the attending physician.

Leprohon and Patel described³⁰ the importance of decision-making expertise in telephone triage. They also crystallized the difficulties of the work, describing it as "decision-making under conditions of uncertainty and urgency," and comparing it to that of air traffic controllers, fire captains, and anesthesiologists. They found a direct correlation between experience and decision-making accuracy. According to Pearson,³⁷ expert health professionals use a rapid, automatic process to recognize familiar problems instantly. Intuition might therefore involve pattern recognition, and can be framed as a cognitive skill. Unlike nurses,³⁰ expert physicians formulate an initial, usually accurate, hypothesis when solving an ill-structured problem in their fields of expertise.³⁸

In this study, the physicians confessed that non-medical/contextual factors affect their decision-making. This observation corresponds with the findings of other studies.^{18,30,39,40} In the traditional medical setting, it is a well-documented phenomenon that patient management decisions are often influenced by the individual patient's circumstance as well.^{29,38} Mercuri et al.¹⁸ claimed that even when clinical uncertainty is minimized, physicians are sensitive also to individual patient context, and management decisions may be influenced by other contextual factors. The novelty of this study is that it shows that non-medical-contextual factors are important factors that are taken into consideration in the physician's decision making, not only in regular medical settings, but also in the telemedicine milieu.

Finally, the physicians recommended several ways to improve the decision-making process, enabling them get to the correct diagnosis and treatment.

Strengths and limitations of the study

The strengths of this study derive from exploring the physicians' personal insights regarding their work in a pediatric telemedicine triage setting. The personal interviews deepen the understanding of existing difficulties and challenges that are encountered by the physicians during their work in telemedicine settings and affect their decision-making process.

This study also shows that non-medical/contextual factors are also important and taken into consideration in the physician's decision making, in telemedicine constellation as well,

and provides new insights regarding the needs and solutions required in this setting.

Limitations of this study include the relatively small number of participants in the context of the qualitative approach, and the fact that only one particular pediatric telemedicine service was investigated.

Although we approached physicians of various backgrounds, different places of residency and work, different ages and religions, and with various levels of experience, participation in the study may have been more appealing to doctors with more positive experiences in their practice, thus introducing a degree of bias (response bias).

CONCLUSIONS

Telemedicine in general and telephone triage in particular, is considered a high-stress clinical activity. This setting involves decision making under conditions of uncertainty and urgency. The physicians working in the pediatric telemedicine setting face various risks, difficulties, and challenges. Although each of these difficulties may be separately seen to a certain extent in the "conventional medicine", the combination of them all is unique to the "online medicine", making it particularly challenging.

Despite the difficulties, the physicians still feel they can give appropriate advice concerning the children's health conditions, confessed they take into consideration also non-medical factors and recommended ways to improve the decision-making process in this online setting.

It is clear, that doctors working in this pediatric telemedicine service should have special qualities and skills, beyond the "ordinary" skills required from "standard" physicians.

Decision makers should be aware of the challenges the clinicians face in this setting, on one hand, and the special expertise and training required, on the other hand. Ways must be found to achieve solutions that enable the doctors reaching the correct diagnosis and best possible treatment decisions under these challenging circumstances.

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ADDITIONAL INFORMATION

The online version of this article (<https://doi.org/10.1038/s41390-018-0117-6>) contains supplementary material, which is available to authorized users.

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